



United States  
Department  
of Agriculture

Forest Service

Rocky Mountain  
Research Station

Research Note  
RMRS-RN-23-7-WWW

December 2004

## ***Fuels Planning: Science Synthesis and Integration***

### **Environmental Consequences Fact Sheet: 7**

## **Fire and Weeds**



Pacific Northwest  
Research Station



North Central  
Research Station

### *Synthesizing Scientific Information for Fire and Fuels Project Managers*

#### **Steve Sutherland**

USDA Forest Service  
Rocky Mountain Research Station  
Fire Sciences Laboratory  
Missoula, MT

Environmental Consequences  
Team Leader

Elaine Kennedy Sutherland  
USDA Forest Service  
Rocky Mountain Research Station  
Missoula, MT

Fuels planning: Science synthesis and integration, an interagency research/management partnership to support the Ten-Year Fire Plan, led by Russell T. Graham, RMRS, and Sarah M. McCaffrey, NCRS.

### **The Weed Problem**

There are nearly 3,500 exotic plant (nonnative introduced) species in the United States. Of these species, 300 have been placed on State or Federal noxious weed lists because of their invasive potential. Currently, weeds infest about 100 million acres and are expanding at the rate of 3 million acres per year. Weed infestations cause an economic loss of \$13 billion per year even though \$9.5 billion per year is spent on weed control measures. In addition to these economic costs, weeds are replacing native species, altering native plant and animal communities, affecting ecosystem health and function, threatening biodiversity and Threatened, Endangered, and Sensitive (TES) species, altering fire behavior and fire regimes, and reducing wildland productivity.

### **Where Are Weeds Found?**

Weeds exploit disturbed sites. These are areas that have reduced competition, exposed mineral soils, and high light and nutrient levels. If weeds are present before the disturbance, or weed seeds arrive after disturbance, weeds will commonly increase on disturbed areas.

### **What Promotes Weed Invasions?**

Most activities that disturb soil and increase light levels create favorable conditions for weed invasions.

#### **Wildfire**

Because of past land management activities and fire suppression policies, fuels have been accumulating for the past century and have resulted in some unusually large, severe, and uncontrollable wildland fires in many areas of the dry forest type. These fires result in increased exposure of mineral soil, reduced plant competition, and increased light and nutrient levels—conditions that are favorable to exotic weed species. In addition, fire can reduce or eliminate biological control (biocontrol) agents previously released to control invasive species. By creating conditions favorable to the rapid expansion of exotic weeds and removing existing barriers to that expansion, wildfires can set the stage for an unprecedented invasion of new weed species and expansion of established weed species.



Orange hawkweed in a postfire area (photo credit: Steve Sutherland).

#### **Fire-Related Management Activities**

In addition to the direct effect of wildfire on weeds, many fire-related management practices such as fire suppression, emergency rehabilitation of burned areas, and salvage logging can also result in habitat disturbance that promotes weed invasion and expansion.

The creation of fire lines (whether by hand or dozer), helispots, and heliports removes competing vegetation, exposes mineral soil, and increases light levels. If the fire is large, then fire suppression resources may come from across the nation or from outside the United States, and may bring new weed propagules with them. Fire fighters, fire equipment, dozers, trucks, and helicopters can all transport weed propagules to fire lines, helispots, and burned areas. The establishment of fire camps also disturbs soil. Weeds already existing in these camps can act as source populations for the introduction of new weed species into the burned areas.

Because of concern about effects of high-severity fires on soil productivity, watershed response, and downstream sedimentation, the Burned Area Emergency Rehabilitation (BAER) program was established to reduce the loss of soil and onsite productivity, reduce the deterioration of water quality, reduce the threat of flooding, and reduce the threat to life and property. While BAER treatments may be effective in reducing soil erosion and flooding, they may have the unintended consequence of promoting weed invasion and expansion. For example, contour felling is sometimes implemented to stop sheet erosion and trap sediment, but the logs can also act as seed traps for weedy species. The combination of exposed mineral soil, increased soil moisture, and high number of weed seeds associated with contour felling can lead to localized, dense populations of weed species that can colonize the adjacent burned areas.

Salvage-logging after wildfires can provide an economic stimulus to the surrounding community. However, salvage logging can also introduce new weed species, transport weed

propagules to weed-free areas, reduce native plant competition, expose mineral soil, and increase light levels. All of these factors can promote weed invasion and expansion.

### Fuels Reduction

Fuels management appears to be the best method to reduce fire hazard and restore natural ecosystem processes, at least in plant communities with historically frequent, low-severity fire. Fuels reduction will still involve the use of fire whether as prescribed fire, wildland fire use, or burning in conjunction with mechanical thinning. Like wildfire, prescribed fires result in increased bare soil, reduced plant competition, and increased light and nutrient levels—conditions that are favorable for exotic weed species.

### Incorporating Weed Management Into Fuel Treatment Activities

Because the difficulty and cost of weed control increase rapidly with size of weed infestation, it is imperative that weeds be controlled as soon as possible. If potential impacts of fire-related management activities on weeds are known, then weed control measures can be part of the fuel treatment plan, and weed populations can be stopped when they are small.

### For More Information

Brown, James K.; Smith, Jane Kapler, eds. 2000. Wildland fire in ecosystems: effects of fire on flora. Gen. Tech. Rep. RMRS-GTR-42-vol. 2. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 257 p.

Fire Effects Information System. [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, Missoula, MT. (2003 October). Available: <http://www.fs.fed.us/database/feis/> [09/07/04].

Galley, K. E. M.; Wilson, T. P., eds. 2001. Proceedings of the invasive species workshop: the role of fire in the control and spread of invasive species. Misc. Publ. No. 11. Tallahassee, FL: Tall Timbers Research Station.

Goodwin, K.; Sheley, R. 2001. Integrated noxious weed management after wildfires. Bozeman, MT: Montana State University.



Canada thistle, 1 month postfire (photo credit: Steve Sutherland).

## Environmental Consequences Fact Sheets

Look for fact sheet topics from the Environmental Consequences Team including information about the effects of fire behavior and alternative treatment strategies, Wildlife Response Model, weed responses, riparian systems, soil erosion, restoration objectives, treated spaces, the Fire Effects Information System (FEIS), and the First Order Fire Effects Model (FOFEM).

## Fuels Planning: Synthesis and Integration

This fact sheet is one in a series being produced as part of a larger project supported by the USDA Forest Service to synthesize new knowledge and information relevant to fire and fuels management. Fact sheets address topics related to stand structure, environmental impacts, economics, and human responses to these factors. Information in the fact sheets is targeted for the dry forests of the Inland West, but is often applicable across broad regions of the country. For more information, please visit our Web site at: [www.fs.fed.us/fire/tech\\_transfer/synthesis/synthesis\\_index](http://www.fs.fed.us/fire/tech_transfer/synthesis/synthesis_index)

*The Fuels Planning fact sheets are based on preliminary findings. Information from fact sheets will be synthesized in an upcoming publication.*